

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
2011 South Clark Place Room  
CP2/5C24  
Arlington, VA 22202  
ETATS-UNIS D'AMERIQUE  
in its capacity as elected Office

|  |  |
|--|--|
| Date of mailing:<br>05 April 2001 (05.04.01)               |  |
| International application No.:<br>PCT/EP00/09499           | Applicant's or agent's file reference:<br>102958/JPR |
| International filing date:<br>27 September 2000 (27.09.00) | Priority date:<br>29 September 1999 (29.09.99)       |
| Applicant:<br>MELERO, Juan                                 |  |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:  
16 January 2001 (16.01.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

|   |   |
|---|---|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br>Facsimile No.: (41-22) 740.14.35 | Authorized officer:<br><br>J. Zahra<br>Telephone No.: (41-22) 338.83.38 |
|---|---|

# PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

## NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To: RUUSKANEN, Juha-Pekka  
Page White & Farrer  
54 Doughty Street  
London WC1N 2LS  
ROYAUME-UNI

**RECEIVED**  
17 APR 2001  
Ans'd .....

|  |  |  |
|--|--|--|
| Date of mailing (day/month/year)<br>05 April 2001 (05.04.01) |  |  |
| Applicant's or agent's file reference<br>102958/JPR          |  | IMPORTANT NOTICE   |
| International application No.<br>PCT/EP00/09499              | International filing date (day/month/year)<br>27 September 2000 (27.09.00) | Priority date (day/month/year)<br>29 September 1999 (29.09.99) |
| Applicant<br>NOKIA NETWORKS OY et al                         |  |  |

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
AU,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE,AG,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,BZ,CA,CH,CN,CR,CU,CZ,DE,DK,DM,DZ,EA,EE,EP,ES,  
FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,  
MN,MW,MX,MZ,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,  
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on  
05 April 2001 (05.04.01) under No. WO 01/24418

### REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

### REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

|   |                                 |
|---|---------------------------------|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer<br>J. Zahra  |
| Facsimile No. (41-22) 740.14.35   | Telephone No. (41-22) 338.83.38 |

## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

To:

RUUSKANEN, Juha-Pekka  
Page White & Farrer  
54 Doughty Street  
London WC1N 2LS  
ROYAUME-UNI

RECEIVED

15 FEB 2002

RISU.....

|   |  |
|---|--|
| Date of mailing (day/month/year)<br>08 February 2002 (08.02.02) | IMPORTANT NOTIFICATION   |
| Applicant's or agent's file reference<br>102958/JPR             |  |
| International application No.<br>PCT/EP00/09499                 | International filing date (day/month/year)<br>27 September 2000 (27.09.00) |

## 1. The following indications appeared on record concerning:

☒ the applicant      ☐ the inventor      ☐ the agent      ☐ the common representative

## Name and Address

NOKIA NETWORKS OY  
Keilalahdentie 4  
FIN-02150 Espoo  
Finland

## State of Nationality

FI

## State of Residence

FI

## Telephone No.

## Facsimile No.

## Teleprinter No.

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person      ☒ the name      ☐ the address      ☐ the nationality      ☐ the residence

## Name and Address

NOKIA CORPORATION  
Keilalahdentie 4  
FIN-02150 Espoo  
Finland

## State of Nationality

FI

## State of Residence

FI

## Telephone No.

## Facsimile No.

## Teleprinter No.

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

☒ the receiving Office      ☐ the designated Offices concerned  
☐ the International Searching Authority      ☒ the elected Offices concerned  
☐ the International Preliminary Examining Authority      ☐ other:
The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Akiko KOYAMA

Telephone No.: (41-22) 338.83.38

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|  |  |  |
|--|--|--|
| Applicant's or agent's file reference<br><b>102958/JPR</b> | <b>FOR FURTHER ACTION</b> <small>see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.</small> |  |
| International application No.<br><b>PCT/EP 00/ 09499</b>   | International filing date (day/month/year)<br><b>27/09/2000</b>  | (Earliest) Priority Date (day/month/year)<br><b>29/09/1999</b> |
| Applicant<br><br><b>NOKIA NETWORKS OY</b>                  |  |  |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

3

☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

EP 00/09499

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 H04B17/00 H04Q7/38 H04L1/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 H04B H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|------------|--|-----------------------|
| Y          | US 5 828 672 A (TURCOTTE ERIC ET AL)<br>27 October 1998 (1998-10-27)<br>abstract; figure 6<br>column 2, line 22 -column 3, line 2<br>column 6, line 49 -column 7, line 6;<br>figure 2<br>column 7, line 30 -column 8, line 65<br>--- | 1-5,7-11              |
| Y          | WO 99 34531 A (ERICSSON TELEFON AB L M)<br>8 July 1999 (1999-07-08)<br>abstract; figure 6<br>page 4, line 22 - line 24<br>page 8, line 1 -page 9, line 2<br>page 9, line 15 - line 22<br>---<br>-/--                                 | 1-5,7-11              |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

30 November 2000

Date of mailing of the international search report

22/12/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Sieben, S

## INTERNATIONAL SEARCH REPORT

International Application No

EP 00/09499

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|------------|--|-----------------------|
| A          | US 5 898 928 A (MAGNUSSON SVERKER ET AL)<br>27 April 1999 (1999-04-27)<br>abstract<br>column 1, line 9 - line 11<br>column 2, line 21 - line 31<br>column 3, line 11 - line 25<br>column 9, line 20 - line 55; figure 7<br>----- | 1-4,7-10              |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

T/EP 00/09499

| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s) |           | Publication<br>date |
|---|---|---------------------|----------------------------|-----------|---------------------|
| US 5828672                                | A | 27-10-1998          | AU                         | 7458998 A | 24-11-1998          |
|   |   |                     | BR                         | 9808699 A | 11-07-2000          |
|   |   |                     | WO                         | 9849800 A | 05-11-1998          |
|   |   |                     | US                         | 6073257 A | 06-06-2000          |
| -----                                     |   |                     |                            |           |                     |
| WO 9934531                                | A | 08-07-1999          | AU                         | 2193199 A | 19-07-1999          |
|   |   |                     | BR                         | 9814501 A | 10-10-2000          |
| -----                                     |   |                     |                            |           |                     |
| US 5898928                                | A | 27-04-1999          | AU                         | 720309 B  | 25-05-2000          |
|   |   |                     | AU                         | 2108697 A | 16-09-1997          |
|   |   |                     | BR                         | 9707800 A | 27-07-1999          |
|   |   |                     | CA                         | 2247493 A | 04-09-1997          |
|   |   |                     | CN                         | 1216668 A | 12-05-1999          |
|   |   |                     | EP                         | 0886983 A | 30-12-1998          |
|   |   |                     | WO                         | 9732444 A | 04-09-1997          |
| -----                                     |   |                     |                            |           |                     |

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|   |   |   |
|---|---|---|
| Applicant's or agent's file reference<br><b>102958/JPR</b>  | <div style="display: flex; justify-content: space-between;"> <div> <b>FOR FURTHER ACTION</b> </div> <div>           See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)         </div> </div> |   |
| International application No.<br><b>PCT/EP00/09499</b>  | International filing date (day/month/year)<br><b>27/09/2000</b>   | Priority date (day/month/year)<br><b>29/09/1999</b> |
| International Patent Classification (IPC) or national classification and IPC<br><b>H04B17/00</b>  |   |   |
| Applicant<br><b>NOKIA NETWORKS OY et al.</b>  |   |   |
| <p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 2 sheets.</p>  |   |   |
| <p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the report</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input checked="" type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input checked="" type="checkbox"/> <u>Certain defects in the international application</u></li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul> |   |   |
| Date of submission of the demand<br><br><b>27/09/2000</b>   | Date of completion of this report<br><br><b>21.12.2001</b>  |   |
| Name and mailing address of the international preliminary examining authority:<br><br><div style="display: flex; align-items: center;"> <div>             European Patent Office<br/>             D-80298 Munich<br/>             Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br/>             Fax: +49 89 2399 - 4465           </div> </div>   | Authorized officer<br><br><b>Burghardt, G</b><br><br>Telephone No. +49 89 2399 8979   |   |





**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP00/09499

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-12 as originally filed

**Claims, No.:**

3-7,8 (part) as originally filed

1,2,8 (part), as received on 01/10/2001 with letter of 28/09/2001  
9-11

**Drawings, sheets:**

1/2,2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP00/09499

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.  
☒ claims Nos. 1-5,7,8.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 1-5,7,8 are so unclear that no meaningful opinion could be formed (*specify*):  
**see separate sheet**

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

- ☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

- ☐ the written form has not been furnished or does not comply with the standard.  
☐ the computer readable form has not been furnished or does not comply with the standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP00/09499

**1. Statement**

|                               |                    |
|-------------------------------|--------------------|
| Novelty (N)                   | Yes: Claims 6,9-11 |
|                               | No: Claims         |
| Inventive step (IS)           | Yes: Claims 6,9-11 |
|                               | No: Claims         |
| Industrial applicability (IA) | Yes: Claims 1-11   |
|                               | No: Claims         |

**2. Citations and explanations  
see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/09499

**Re Item I**

**Basis of the report**

Claims 1 and 8 are based on original claims 1 and 8 and the description, page 11.

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step or industrial applicability**

The feature added to independent claims 1 and 8 "said network indicator associating with a corresponding feature of the communication path than said third indicator" is so unclear that novelty and inventive step cannot be assessed.

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following document:

D1: US-A-5 828 672 (TURCOTTE ERIC ET AL) 27 October 1998 (1998-10-27)

2. The combination of features of claims 1, 2 and 6 is neither known from, nor rendered obvious by, the available prior art.  
The same applies to the combination of claims 8 and 9.

**Re Item VII**

**Certain defects in the international application**

1. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
2. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/EP00/09499

3. The description should have been brought in conformity with the newly filed claims as required by Rule 5.1(a)(iii) PCT.

## Claims

1. A method in a communication system for estimating a network indicator of a communication path between a first station and a second station comprising:

5 determining at the second station a first indicator of the communication path in a direction from the first station to the second station;

10 determining at the first station a second indicator of the communication path in a direction from the second station to the first station, said second indicator associating with a corresponding feature of the communication path than said first indicator;

15 determining at the second station a third indicator of the communication path in the direction from the first station to the second station; and

20 estimating the network indicator of the communication path in the direction from the second station to the first station based on the determined first, second and third indicators, said network indicator associating with a corresponding feature of the communication path than said third indicator.

2. A method according to claim 1, wherein the second station  
25 comprises a base station of a cellular communication system, the first station comprises a mobile station of the cellular communication system, the communication path comprises a radio link between the stations, the first indicator comprises a bit error ratio in uplink direction, the second indicator  
30 comprises a bit error ratio in downlink direction; the third indicator comprises a frame erasure ratio in uplink direction; and the network indicator to be estimated comprises a frame erasure ratio in downlink direction.

associating with a corresponding feature of the communication path than said first indicator;

a measurement unit at the second station for determining a third indicator of the communication path in the direction  
5 from the first station to the second station; and

control unit for estimating a further indicator of the communication path based on the determined first, second and third indicators, said further indicator associating with a corresponding feature of the communication path than said  
10 third indicator.

9. A communication system according to claim 8, wherein the second station comprises a base station of a cellular communication system, the first station comprises a mobile  
15 station of the cellular communication system, the communication path comprises a radio link between the stations, the first indicator comprises a bit error ratio in uplink direction, the second indicator comprises a bit error ratio in downlink direction; the third indicator comprises a  
20 frame erasure ratio in uplink direction, and the further indicator comprises a frame erasure ratio in downlink direction.

10. A communication system according to claim 8 or 9, wherein  
25 the estimated indicator is used for assessing the quality of the communication path.

11. A communication system according to any of claims 8 to 10, wherein the control unit is arranged to correlate the  
30 first indicator, the second indicator and the third indicator for obtaining the further indicator.

## Claims

1. A method in a communication system for estimating a network indicator of a communication path between a first station and a second station comprising:

determining at the second station a first indicator of the communication path in a direction from the first station to the second station;

determining at the first station a second indicator of the communication path in a direction from the second station to the first station, said second indicator associating to a corresponding feature of the communication path than said first indicator;

determining at the second station a third indicator of the communication path in the direction from the first station to the second station; and

estimating the network indicator of the communication path in the direction from the second station to the first station based on the determined first, second and third indicators.

2. A method according to claim 1, wherein the second station comprises a base station of a cellular communication system, the first station comprises a mobile station of the cellular communication system, the communication path comprises a radio link between the stations, the first indicator comprises a bit error ratio in uplink direction, the second indicator comprises a bit error ratio in downlink direction; the third indicator comprises a frame erasure ratio in uplink direction; and the network indicator to be estimated comprises a frame erasure ratio in downlink direction.



associating to a corresponding feature of the communication path than said first indicator;

a measurement unit at the second station for determining a third indicator of the communication path in the direction  
5 from the first station to the second station; and

control unit for estimating a further indicator of the communication path based on the determined first, second and third indicators.

10 9. A communication system according to claim 8, wherein the second station comprises a base station of a cellular communication system, the first station comprises a mobile station of the cellular communication system, the communication path comprises a radio link between the  
15 stations, the first indicator comprises a bit error ratio in uplink direction, the second indicator comprises a bit error ratio in downlink direction; the third indicator comprises a frame erasure ratio in uplink direction, and the further indicator comprises a frame erasure ratio in downlink  
20 direction.

10. A communication system according to claim 8 or 9, wherein the estimated indicator is used for assessing the quality of the communication path.

25 11. A communication system according to any of claims 8 to 10, wherein the control unit is arranged to correlate the first indicator, the second indicator and the third indicator for obtaining the further indicator.

30

COPY

PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) 102958/JPR

## Box No. I TITLE OF INVENTION

ESTIMATING AN INDICATOR FOR A COMMUNICATION PATH

## Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Nokia Networks Oy  
Keilalahdentie 4  
FIN-02150 ESPOO  
Finland

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

Finland

State (that is, country) of residence:

Finland

This person is applicant  
for the purposes of:

☐ all designated  
States

☒ all designated States except  
the United States of America

☐ the United States  
of America only

☐ the States indicated in  
the Supplemental Box

## Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

MELERO, Juan  
2A Adele Avenue  
Digswell  
Hertfordshire AL6 0AU  
United Kingdom

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box  
is marked, do not fill in below.)

State (that is, country) of nationality:

Spain

State (that is, country) of residence:

United Kingdom

This person is applicant  
for the purposes of:

☐ all designated  
States

☐ all designated States except  
the United States of America

☒ the United States  
of America only

☐ the States indicated in  
the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

## Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf  
of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

RUUSKANEN, Juha-Pekka  
PAGE WHITE & FARRER  
54 Doughty Street  
London WC1N 2LS  
United Kingdom

Telephone No.

020 7831-7929

Facsimile No.

020 7831-8040

Teleprinter No.

8955681

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

**Box No.V DESIGNATION OF STATES**

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

**Regional Patent**

- ☒ **AP** ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

**National Patent** (if other kind of protection or treatment desired, specify on dotted line):

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> <b>AE</b> United Arab Emirates                  | <input checked="" type="checkbox"/> <b>LC</b> Saint Lucia                               |
| <input checked="" type="checkbox"/> <b>AG</b> Antigua and Barbuda                   | <input checked="" type="checkbox"/> <b>LK</b> Sri Lanka                                 |
| <input checked="" type="checkbox"/> <b>AL</b> Albania                               | <input checked="" type="checkbox"/> <b>LR</b> Liberia                                   |
| <input checked="" type="checkbox"/> <b>AM</b> Armenia                               | <input checked="" type="checkbox"/> <b>LS</b> Lesotho                                   |
| <input checked="" type="checkbox"/> <b>AT</b> Austria                               | <input checked="" type="checkbox"/> <b>LT</b> Lithuania                                 |
| <input checked="" type="checkbox"/> <b>AU</b> Australia                             | <input checked="" type="checkbox"/> <b>LU</b> Luxembourg                                |
| <input checked="" type="checkbox"/> <b>AZ</b> Azerbaijan                            | <input checked="" type="checkbox"/> <b>LV</b> Latvia                                    |
| <input checked="" type="checkbox"/> <b>BA</b> Bosnia and Herzegovina                | <input checked="" type="checkbox"/> <b>MA</b> Morocco                                   |
| <input checked="" type="checkbox"/> <b>BB</b> Barbados                              | <input checked="" type="checkbox"/> <b>MD</b> Republic of Moldova                       |
| <input checked="" type="checkbox"/> <b>BG</b> Bulgaria                              | <input checked="" type="checkbox"/> <b>MG</b> Madagascar                                |
| <input checked="" type="checkbox"/> <b>BR</b> Brazil                                | <input checked="" type="checkbox"/> <b>MK</b> The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> <b>BY</b> Belarus                               | <input checked="" type="checkbox"/> <b>MN</b> Mongolia                                  |
| <input checked="" type="checkbox"/> <b>BZ</b> Belize                                | <input checked="" type="checkbox"/> <b>MW</b> Malawi                                    |
| <input checked="" type="checkbox"/> <b>CA</b> Canada                                | <input checked="" type="checkbox"/> <b>MX</b> Mexico                                    |
| <input checked="" type="checkbox"/> <b>CH and LI</b> Switzerland and Liechtenstein  | <input checked="" type="checkbox"/> <b>MZ</b> Mozambique                                |
| <input checked="" type="checkbox"/> <b>CN</b> China                                 | <input checked="" type="checkbox"/> <b>NO</b> Norway                                    |
| <input checked="" type="checkbox"/> <b>CR</b> Costa Rica                            | <input checked="" type="checkbox"/> <b>NZ</b> New Zealand                               |
| <input checked="" type="checkbox"/> <b>CU</b> Cuba                                  | <input checked="" type="checkbox"/> <b>PL</b> Poland                                    |
| <input checked="" type="checkbox"/> <b>CZ</b> Czech Republic                        | <input checked="" type="checkbox"/> <b>PT</b> Portugal                                  |
| <input checked="" type="checkbox"/> <b>DE</b> Germany                               | <input checked="" type="checkbox"/> <b>RO</b> Romania                                   |
| <input checked="" type="checkbox"/> <b>DK</b> Denmark                               | <input checked="" type="checkbox"/> <b>RU</b> Russian Federation                        |
| <input checked="" type="checkbox"/> <b>DM</b> Dominica                              | <input checked="" type="checkbox"/> <b>SD</b> Sudan                                     |
| <input checked="" type="checkbox"/> <b>DZ</b> Algeria                               | <input checked="" type="checkbox"/> <b>SE</b> Sweden                                    |
| <input checked="" type="checkbox"/> <b>EE</b> Estonia                               | <input checked="" type="checkbox"/> <b>SG</b> Singapore                                 |
| <input checked="" type="checkbox"/> <b>ES</b> Spain                                 | <input checked="" type="checkbox"/> <b>SI</b> Slovenia                                  |
| <input checked="" type="checkbox"/> <b>FI</b> Finland                               | <input checked="" type="checkbox"/> <b>SK</b> Slovakia                                  |
| <input checked="" type="checkbox"/> <b>GB</b> United Kingdom                        | <input checked="" type="checkbox"/> <b>SL</b> Sierra Leone                              |
| <input checked="" type="checkbox"/> <b>GD</b> Grenada                               | <input checked="" type="checkbox"/> <b>TJ</b> Tajikistan                                |
| <input checked="" type="checkbox"/> <b>GE</b> Georgia                               | <input checked="" type="checkbox"/> <b>TM</b> Turkmenistan                              |
| <input checked="" type="checkbox"/> <b>GH</b> Ghana                                 | <input checked="" type="checkbox"/> <b>TR</b> Turkey                                    |
| <input checked="" type="checkbox"/> <b>GM</b> Gambia                                | <input checked="" type="checkbox"/> <b>TT</b> Trinidad and Tobago                       |
| <input checked="" type="checkbox"/> <b>HR</b> Croatia                               | <input checked="" type="checkbox"/> <b>TZ</b> United Republic of Tanzania               |
| <input checked="" type="checkbox"/> <b>HU</b> Hungary                               | <input checked="" type="checkbox"/> <b>UA</b> Ukraine                                   |
| <input checked="" type="checkbox"/> <b>ID</b> Indonesia                             | <input checked="" type="checkbox"/> <b>UG</b> Uganda                                    |
| <input checked="" type="checkbox"/> <b>IL</b> Israel                                | <input checked="" type="checkbox"/> <b>US</b> United States of America                  |
| <input checked="" type="checkbox"/> <b>IN</b> India                                 | <input checked="" type="checkbox"/> <b>UZ</b> Uzbekistan                                |
| <input checked="" type="checkbox"/> <b>IS</b> Iceland                               | <input checked="" type="checkbox"/> <b>VN</b> Viet Nam                                  |
| <input checked="" type="checkbox"/> <b>JP</b> Japan                                 | <input checked="" type="checkbox"/> <b>YU</b> Yugoslavia                                |
| <input checked="" type="checkbox"/> <b>KE</b> Kenya                                 | <input checked="" type="checkbox"/> <b>ZA</b> South Africa                              |
| <input checked="" type="checkbox"/> <b>KG</b> Kyrgyzstan                            | <input checked="" type="checkbox"/> <b>ZW</b> Zimbabwe                                  |
| <input checked="" type="checkbox"/> <b>KP</b> Democratic People's Republic of Korea |   |
| <input checked="" type="checkbox"/> <b>KR</b> Republic of Korea                     |   |
| <input checked="" type="checkbox"/> <b>KZ</b> Kazakhstan                            |   |

Check-box reserved for designating States which have become party to the PCT after issuance of this sheet:



**Precautionary Designation Statement:** In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

**Supplemental Box**
*If the Supplemental Box is not used, this sheet should not be included in the request.*

1. If, in any of the Boxes, the space is insufficient to furnish all the information: in such case, write "Continuation of Box No. ..." [indicate the number of the Box] and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:

- (i) if more than two persons are involved as applicants and/or inventors and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;
- (ii) if, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;
- (iii) if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;
- (iv) if, in addition to the agent(s) indicated in Box No. II, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;
- (v) if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. I, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. I" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;
- (vi) if, in Box No. IT, there are more than three earlier applications whose priority is claimed: in such case, write "Continuation of Box No. IT" and indicate for each additional earlier application the same type of information as required in Box No. IT;
- (vii) if, in Box No. IT, the earlier application is an ARIPO application: in such case, write "Continuation of Box No. IT", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed.

2. If, with regard to the precautionary designation statement contained in Box No. I, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.

3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning non-prejudicial disclosures or exceptions to lack of novelty: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.

Continuation of Box IV

Agents continues

PALMER, Roger (GB)  
 RICHARDS, David John (GB)  
 PENDLEBURY, Anthony (GB)  
 JENKINS, Peter David (GB)  
 DRIVER, Virginia Rozanne (GB)  
 DANIELS, Jeffery Nicholas (GB)  
 NEOBARD, William John (GB)  
 SHACKLETON, Nicola (GB)  
 SLINGSBY, Philip Roy (GB)  
 HILL, Christopher Michael (GB)  
 WILLIAMS, David John (GB)

All of:

PAGE WHITE & FARRER  
 54 Doughty Street  
 London WC1N 2LS  
 United Kingdom

| <b>Box No. VI PRIORITY CLAIM</b>   |                               | <input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.   |                                       |   |
|--|-------------------------------|---|---------------------------------------|---|
| Filing date of earlier application (day/month/year)  | Number of earlier application | Where earlier application is:   |                                       |   |
|  |                               | national application: country   | regional application: regional Office | international application: receiving Office |
| item (1)<br>29 September 1999  | 9923069.0                     | GB  |                                       |   |
| item (2)   |                               |   |                                       |   |
| item (3)   |                               |   |                                       |   |
| <input type="checkbox"/> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): |                               |   |                                       |   |
| <i>* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.</i>  |                               |   |                                       |   |
| <b>Box No. VII INTERNATIONAL SEARCHING AUTHORITY</b>   |                               |   |                                       |   |
| <b>Choice of International Searching Authority (ISA)</b><br>(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):  |                               | <b>Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):</b>   |                                       |   |
| ISA / EP   |                               | Date (day/month/year)   | Number                                | Country (or regional Office)                |
|  |                               | 19 May 2000   | RS 103920                             | EP  |
| <b>Box No. VIII CHECK LIST; LANGUAGE OF FILING</b>   |                               |   |                                       |   |
| This international application contains the following number of sheets:<br>request : 4<br>description (excluding sequence listing part) : 12<br>claims : 3<br>abstract : 1<br>drawings : 2<br>sequence listing part of description : _____<br>Total number of sheets : 22  |                               | This international application is accompanied by the item(s) marked below:<br>1. <input checked="" type="checkbox"/> fee calculation sheet<br>2. <input type="checkbox"/> separate signed power of attorney<br>3. <input checked="" type="checkbox"/> copy of general power of attorney; reference number, if any:<br>4. <input type="checkbox"/> statement explaining lack of signature<br>5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):<br>6. <input type="checkbox"/> translation of international application into (language):<br>7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material<br>8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form<br>9. <input type="checkbox"/> other (specify): |                                       |   |
| Figure of the drawings which should accompany the abstract: 3  |                               | Language of filing of the international application: EN   |                                       |   |
| <b>Box No. IX SIGNATURE OF APPLICANT OR AGENT</b>  |                               |   |                                       |   |
| Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).   |                               |   |                                       |   |
| RUUSKANEN, Juha-Pekka.....(Agent)  |                               |   |                                       |   |

|   |  |
|---|--|
| For receiving Office use only   |  |
| 1. Date of actual receipt of the purported international application:   | 2. Drawings:<br><br><input type="checkbox"/> received:<br><br><input type="checkbox"/> not received: |
| 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application: |  |
| 4. Date of timely receipt of the required corrections under PCT Article 11(2):  |  |
| 5. International Searching Authority (if two or more are competent): ISA /  | 6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.             |

|   |  |
|---|--|
| For International Bureau use only                               |  |
| Date of receipt of the record copy by the International Bureau: |  |

The demand must be filed directly with the competent International Preliminary Examining Authority. If two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ EPO

**PCT**

**CHAPTER II**

# **DEMAND**

under Article 31 of the Patent Cooperation Treaty:  
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

|  |   |
|--|---|
| For International Preliminary Examining Authority use only   |   |
| Identification of IPEA   | Date of receipt of DEMAND   |
| <b>Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION</b>   |   |
| Applicant's or agent's file reference<br>102958/JPR  |   |
| International application No.<br>PCT/EP00/09499  | International filing date (day/month/year)<br>27 September 2000<br><br>(Earliest) Priority date (day/month/year)<br>29 September 1999 |
| Title of invention<br>ESTIMATING AN INDICATOR FOR A COMMUNICATION PATH   |   |
| <b>Box No. II APPLICANT(S)</b>   |   |
| Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)<br><br>Nokia Networks Oy<br>Keilalahdentie 4<br>FIN-02150 ESPOO<br>Finland                    |   |
| Telephone No.:<br><br>Facsimile No.:<br><br>Teleprinter No.:   |   |
| State (that is, country) of nationality:<br>Finland (FI)   | State (that is, country) of residence:<br>Finland (FI)  |
| Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)<br><br>MELERO, Juan<br>2A Adele Avenue<br>Digswell<br>Hertfordshire AL6 0AU<br>United Kingdom |   |
| State (that is, country) of nationality:<br>Spain (ES)   | State (that is, country) of residence:<br>United Kingdom (GB)   |
| Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)<br><br><br><br><br><br>   |   |
| State (that is, country) of nationality:   | State (that is, country) of residence:  |
| <input type="checkbox"/> Further applicants are indicated on a continuation sheet.   |   |

**Box No. III AGENT OR COMMON REPRESENTATIVE, OR ADDRESS FOR CORRESPONDENCE**The following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*PAGE WHITE & FARRER  
54 Doughty Street  
London WC1N 2LS  
United Kingdom

Telephone No.:

020 7831-7929

Facsimile No.:

020 7831-8040

Teleprinter No.:

8955681

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:\***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed

the description

☒ as originally filed☐ as amended under Article 34

the claims

☒ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34

the drawings

☒ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

\* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: EN☒ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☐ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

**Box No. VI CHECK LIST**

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- |  |   |   |        |
|--|---|---|--------|
| 1. translation of international application                              | : |   | sheets |
| 2. amendments under Article 34   | : |   | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : |   | sheets |
| 4. copy (or, where required, translation) of statement under Article 19  | : |   | sheets |
| 5. letter  | : | 1 | sheets |
| 6. other ( <i>specify</i> )  | : |   | sheets |

For International Preliminary Examining Authority use only

received                      not received

|                          |                          |
|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |

The demand is also accompanied by the item(s) marked below:

- |  |   |
|--|---|
| 1. <input type="checkbox"/> fee calculation sheet  | 4. <input type="checkbox"/> statement explaining lack of signature                                  |
| 2. <input type="checkbox"/> separate signed power of attorney                            | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other ( <i>specify</i> ):   |

**Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE**

*Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).*

RUUSKANEN, Juha-Pekka.....(Agent)

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:



(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
5 April 2001 (05.04.2001)

PCT

(10) International Publication Number  
**WO 01/24418 A1**

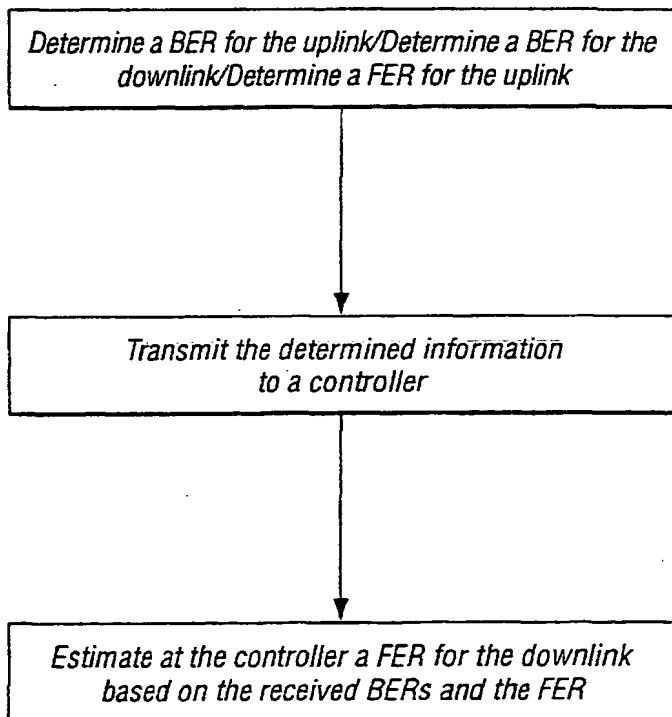
- (51) International Patent Classification<sup>7</sup>: **H04B 17/00**, (74) Agents: **RUUSKANEN, Juha-Pekka et al.**; Page White & Farrer, 54 Doughty Street, London WC1N 2LS (GB).  
**H04Q 7/38**, **H04L 1/20**
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(54) Title: ESTIMATING AN INDICATOR FOR A COMMUNICATION PATH



(57) Abstract: The present invention relates to estimation of a network indicator of a communication path between a first station and a second station in a communication system. A first indicator of the communication path in a direction from the first station to the second station is determined at the second station. A second indicator of the communication path in a direction from the second station to the first station is determined at the first station. Said second indicator associates to a corresponding feature of the communication path than said first indicator. A third indicator of the communication path in the direction from the first station to the second station is determined at the second station. The network indicator of the communication path in the direction from the second station to the first station is then estimated based on the determined first, second and third indicators.

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## ESTIMATING AN INDICATOR FOR A COMMUNICATION PATH

## Field of the Invention

- 5 The present invention relates to a communication path or link in a communication system, and in particular, but not exclusively, to estimation of an indicator for use in managing a communication path between at least two stations of a communication system.

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## Background of the Invention

- A communication network may comprise a cellular radio network consisting of cells. The cellular telecommunication networks typically operate in accordance with a given standard (or  
15 several standards) which sets out what the elements of the network are permitted to do and how that should be achieved. In most cases a cell can be defined as a certain area covered by one or several base transceiver stations (BTS) serving  
20 mobile stations (MS) within the cell via a radio interface. Each base-station has a radio transceiver capable of transmitting radio signals in downlink to and receiving radio signals in uplink from the area of a cell next to the base-station. By means of these signals the base station can  
25 communicate with the mobile station (MS) terminal in that cell, which itself includes a radio transceiver. Each base station may be connected to a base station controller (BSC) or to any other controller functionality provided by the cellular network. Thus a mobile station (MS) or similar user equipment  
30 (UE) within a cell of the system is continuously controlled by a node providing controller functionality. Examples of the network controller include said base station controller (BSC), a radio network controller (RNC) and a mobile switching center (MSC), but other control nodes may also be used for the

implementation of the network control functionality. The controller can be linked further to the public telephone network and/or to other networks such as packet data networks. By means of this system a user of the MS can establish a  
5 telephone call to the public network via a BS in whose cell the MS is located.

The location of the MS could be fixed (for example if it is providing radio communications for a fixed site) or the MS  
10 could be moveable (for example if it is a hand portable transceiver or "mobile phone"). When the MS is moveable it may move between cells of the cellular radio system. As it moves from one cell (the "old cell") to another cell (the "new cell") there is a need to hand it over from communication with  
15 the BS of the old cell to the BS of the new cell without dropping the call due to a break in communications between the mobile station and the network. This process is known as handover. A need can also arise to hand over a MS whose location is fixed, for example if atmospheric conditions  
20 affect its communications with the old BS and call quality can be improved by handing it over to another BS or if there is a need to free up capacity of the old BS.

In some cellular systems a mobile station is capable of making  
25 traffic communications with more than one base station at one time. This macrodiversity arrangement allows greater reliability of communications and can reduce the required transmission power. It also means that handovers between one base station and another can be performed in a gradual  
30 ("soft") rather than an abrupt ("hard") way.

The control node conventionally receives information relating to the quality of communications between the MS and the BSs and optionally other information such as data on the load on

at least some of the BSs. The control node uses this information to various functions. For example, by using this information the control node may determine which base station(s) an MS should communicate with and issues instructions to the BS and the MS accordingly.

The mobile station and/or the base station may measure and/or define several indicators or parameters concerning the communication path connection, such as quality of the received signal, signal levels (power) between the receiving and transmitting stations, distance between the stations and so on. The stations can be provided with appropriate means for defining a value for any parameter that can be measured for the interaction between the mobile station and any of the base stations or the radio transmission conditions in a cell.

In a cellular radio communication system, such as the GSM based systems, voice quality in a transmission over a communication path between a base station and a mobile station can be assessed based on a network indicator determined for the connection. Corresponding indicators may be defined both in uplink and downlink.

Currently the most commonly used quality parameter or indicator is so called Bit Error Ratio (BER), which is used e.g. in the GSM (Global System for Mobile) based network systems. The BER is a measure defining the level of quality for data transmission expressed as the relationship between erroneous bits and the total number of transmitted bits. The BER can be defined e.g. by sending a known bit pattern and counting the number of incorrectly received bits in the receiver.

A problem with the BER is that it measures the rate of the bit errors before an error correction mechanism. Therefore it does not take any improvements possibly produced by the error correction mechanism into the connection quality. If the functionality and/or efficiency of the error correction mechanism changes during the operation of the system, the BER values may no longer provide reliable information for assessing the quality of the transmission. The reliability of the BER based quality estimations may also become poorer due to new functionalities introduced into the network. The new functionalities could be such as Frequency Hopping or dynamic Channel Coding.

The inventor of the present invention has identified that frame erasure ratio (FER) could form a network indicator that could be used for the transmission quality estimation and that by using FER at least some of the problems of the BER could be avoided. In general, the FER represents the percentage of frames being dropped due to high number of non corrected bit errors in the frame. The FER can be a measurement of the results of 3-bit cyclic redundancy check for speech channels that is made along with a bad frame indicator (BFI). For signalling channels the FER is a measurement of errors in the block code used for the transmission.

A problem with the FER is that the current terminals do not report downlink FER to the network. There is no appropriate solution to manage the current terminals in a system that may base the connection control to an indicator such as the FER. It would thus be desirable to be able to define the FER or a similar network indicator by some other means than by receiving information of the indicator from a terminal that received the transmission.

## Summary of the Invention

It is an aim of the embodiments of the present invention to address one or several of the above problems.

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According to one aspect of the present invention, there is provided a method in a communication system for estimating a network indicator of a communication path between a first station and a second station comprising:

10 determining at the second station a first indicator of the communication path in a direction from the first station to the second station;

determining at the first station a second indicator of the communication path in a direction from the second station  
15 to the first station, said second indicator associating to a corresponding feature of the communication path than said first indicator;

determining at the second station a third indicator of the communication path in the direction from the first station  
20 to the second station; and

estimating the network indicator of the communication path in the direction from the second station to the first station based on the determined first, second and third  
indicators.

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According to another aspect of the present invention there is provided a communication system comprising a first station; a second station; a communication path between the first and the second stations; a measurement unit at the second station for  
30 determining a first indicator of the communication path in a direction from the first station to the second station; a measurement unit at the first station for determining a second indicator of the communication path in a direction from the second station to the first station, said second indicator

associating to a corresponding feature of the communication path than said first indicator; a measurement unit at the second station for determining a third indicator of the communication path in the direction from the first station to the second station; and control unit for estimating a further indicator of the communication path based on the determined first, second and third indicators.

According to further aspects the second station comprises a base station of a cellular communication system, the first station comprises a mobile station of the cellular communication system, the communication path comprises a radio link between the stations, the first indicator comprises a bit error ratio in uplink direction, the second indicator comprises a bit error ratio in downlink direction; the third indicator comprises a frame erasure ratio in uplink direction; and the network indicator to be estimated comprises a frame erasure ratio in downlink direction.

The estimated network indicator may be used for assessing the quality of the communication path.

The network indicator may be obtained based on a correlation between the first indicator, the second indicator and the third indicator. The network indicator may be obtained by multiplying said second indicator by the third indicators and dividing the result by the first indicator.

Information about the first indicator, the second indicator and the third indicator may be passed to a controller of the communication system and computing the network indicator by the controller.

Brief Description of Drawings

For better understanding of the present invention, reference will now be made by way of example to the accompanying drawings in which:

5        Figure 1 shows schematically the configuration of a part of a typical cellular radio telecommunications network;

      Figure 2 is a more detailed illustration of a mobile station and base station pair;

10       Figure 3 is a flowchart illustrating the operation of one embodiment of the present invention.

#### Description of Preferred Embodiments of the Invention

15       The present reporting method and associated apparatus will be described below with general reference to the GSM system, but it will be understood that the method is analogously applicable to provide enhanced parameter estimation in other telecommunications systems.

20       Reference is made to Figure 1 illustrating one system in which the embodiments of the invention may be employed. The exemplifying system is a mobile radio communication system allowing a plurality of mobile stations MS1, MS2, MS3 to communicate with a base (transceiver) station BTS in a common  
25       cell via respective channels CH1, CH2, CH3. Although not shown, the mobile stations may also move from one cell to another cell. The radio communication between a transmitting station and a receiving station may be implemented in any appropriate manner and may be based on any communication  
30       standard. Therefore the communication path as such will not be described in more detail herein. It is sufficient to note that each base transceiver station (BTS) is arranged to transmit signals via a radio interface or link to and receive signals from the mobile stations MS located in a cell associated with



the given base transceiver station. Likewise, each mobile station MS is able to transmit signals to and receive signals via a radio interface or link from the base transceiver station BTS.

5

The base station is connected to a controller, which in one form of the exemplifying GSM system comprises a base station controller (BSC). The BSC may be connected further to a Mobile Switching Centre (MSC; not shown). In the described embodiment the BSC is used as a radio network controller. However, in some arrangements the MSC could be used for controlling one or several base stations. In some embodiment the BSC between the MSC and the base station may also be omitted. The network controller functionality is for controlling its service area, i.e. the cells and base stations connected to it. It is noted that typically more than one network controller is provided in a network. The network controller is also connected further to other elements or parts of the telecommunications network system via a suitable linking or gateway apparatus, such as Gateway Mobile Switching Centre (GMSC; not shown).

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The implementation of the basic communication formatting between the mobile station, the base station and the controller in GSM systems is known, and will thus not be discussed in more detail herein. It is sufficient to note that the interface may comprise channels in both uplink and downlink directions between the mobile station in the cell associated with a given base station and that the information sent to and from the mobile station may be sent in any suitable format. The information may include, for example, an identification of a mobile station in a message sent from the mobile station identifying the particular mobile station (for instance, MS ID and/or IMSI (Mobile Station Identity and/or International Mobile Subscriber Identity, respectively)).

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The mobile stations and the base station are arranged to perform measurements in order to be able to provide predefined information to the controller. These measurements may be of any appropriate feature that is in some way indicative of the quality or some other characteristics of traffic communications over the link between the mobile station and the base station. The information may comprise various parameters or indicators, such as an indicator from which it is possible to estimate the quality of the connection. Examples are signal strength of the base station for the cell as received at the mobile station and vice versa, error rate of communications (e.g. bit error rate or frame error rate), or delay or distortion of such communications. The information of the measurement results may then be used e.g. by the controller functionality. For example, the controller may use the information to decide an appropriate cell that can be selected for serving the mobile station.

Figure 2 shows in more detail a mobile station and base station pair capable of operation in the system of figure 1. The mobile station, which in this case is a cellular telephone, includes a radio transceiver unit 20, a measurement unit 21 and a control unit 22. The base station includes correspondingly a radio transceiver unit 23, a measurement unit 24 and a control unit 25. The controller BSC is shown to include a control unit 26 for accomplishing computations of the embodiments of the invention. These units may be implemented as distinct units as illustrated in figure 2 or by software running on common hardware.

The transceiver 20 of the mobile station transmits traffic signals to and receives traffic signals from one or more base stations to which the mobile station is currently attached.

The transmissions to and from the mobile station are split into multiframe, each of which occupies a certain predefined time, e.g. 480ms. The transceiver may also receives signals from other base stations, typically signals on one or more broadcast channels e.g. BCCH. These signals as well as signals received from the base station(s) to which the mobile station is attached are directed to the measurement unit 21. The measurement unit measures a predefined feature of those signals as mentioned above - for example the bit error rate (BER) of the received signal. The measurement results are passed to the control unit 22 which generates appropriate measurement reports in accordance with the used standard. The measurement reports are then transmitted to the base station(s) to which the mobile station is attached. The measurement reports are then used by the network, e.g. to make handover or load balancing decisions.

The mobile station MS is arranged to measure and report a downlink bit error rate (DL BER) for the signals received from the base station BTS to the controller BSC via the base station BTS by an appropriate measurement report mechanism. For example, in the GSM networks the BER is reported by the mobiles to the system as RXQUAL message (received transmission quality). The base station is arranged to measure an uplink bit error rate (UL BER) for the transmission received from the mobile station. The UL BER is reported to the BSC in order to be used for statistics and the handover and power control mechanisms. The UL BER may also be used in one of embodiments of the invention, as will be described later in this specification. The base station BTS is also arranged to determine a uplink erasure ration (UL FER) based on Bad Frame Indicator (BFI) calculations.

According to an embodiment of the invention the UL FER, UL BER and DL BER are used to estimate the DL FER. In this embodiment the estimation is based on the realisation that the changes and/or new features, such as Frequency Hopping and Dynamic Channel Coding, have the same effect over the Error Correction mechanism in the uplink and downlink directions. Therefore the change in the indicators is also equivalent. This means that the correlation between the BER and the FER in the Uplink will be the equivalent to the corresponding correlation of the BER and the FER in the downlink. Thus by calculating a BER-FER correlation in up-link the DL FER can be derived from by means of the DL BER. This can be exemplified by the equation:

$$DL\ FER = DL\ BER \times UL\ FER / UL\ BER$$

The required calculations for the estimation may be accomplished in the network controller, such as the BSC. According to one alternative the calculations are accomplished in the base station by the control unit 25 thereof.

The above embodiment enables use of the FER even with terminals that do not support FER reporting, and thereby the embodiments enable FER based quality estimation even when such mobile stations are used.

According to an alternative the mobile station determined two indicators for the connection quality and is provided with an indicator (e.g. UL BER) determined by the base station. In this embodiment the mobile station will then determine the "missing" indicator from the comparison of the three measured indicators. In other words, in this case the above presented exemplifying equation would be:

$$UL\ FER = UL\ BER \times DL\ FER / DL\ BER$$

It should be appreciated that whilst embodiments of the present invention have been described in relation to mobile stations, embodiments of the present invention are applicable to any other suitable type of user equipment, including terminals with fixed line connections.

It is also noted herein that while the above describes exemplifying embodiments of the invention, there are several variations and modifications which may be made to the disclosed solution without departing from the scope of the present invention as defined in the appended claims.

**Claims**

1. A method in a communication system for estimating a network indicator of a communication path between a first station and a second station comprising:

determining at the second station a first indicator of the communication path in a direction from the first station to the second station;

determining at the first station a second indicator of the communication path in a direction from the second station to the first station, said second indicator associating to a corresponding feature of the communication path than said first indicator;

determining at the second station a third indicator of the communication path in the direction from the first station to the second station; and

estimating the network indicator of the communication path in the direction from the second station to the first station based on the determined first, second and third indicators.

2. A method according to claim 1, wherein the second station comprises a base station of a cellular communication system, the first station comprises a mobile station of the cellular communication system, the communication path comprises a radio link between the stations, the first indicator comprises a bit error ratio in uplink direction, the second indicator comprises a bit error ratio in downlink direction; the third indicator comprises a frame erasure ratio in uplink direction; and the network indicator to be estimated comprises a frame erasure ratio in downlink direction.

3. A method according to claim 1 or 2, wherein the estimated network indicator is used for assessing the quality of the communication path.

5 4. A method according to claim 3, wherein voice quality of the transmission via the communication path is assessed.

5. A method according to any of the preceding claims, wherein the network indicator is obtained based on a  
10 correlation between the first indicator, the second indicator and the third indicator.

6. A method according to claim 5, wherein the network indicator is obtained by multiplying said second indicator by  
15 the third indicator and dividing the result by the first indicator.

7. A method according to any of the preceding claims, comprising passing information about the first indicator, the  
20 second indicator and the third indicator to a controller of the communication system and computing the network indicator by the controller.

8. A communication system comprising:  
25 a first station;  
a second station;  
a communication path between the first and the second stations;  
a measurement unit at the second station for determining  
30 a first indicator of the communication path in a direction from the first station to the second station;  
a measurement unit at the first station for determining a second indicator of the communication path in a direction from the second station to the first station, said second indicator

associating to a corresponding feature of the communication path than said first indicator;

5 a measurement unit at the second station for determining a third indicator of the communication path in the direction from the first station to the second station; and

control unit for estimating a further indicator of the communication path based on the determined first, second and third indicators.

10 9. A communication system according to claim 8, wherein the second station comprises a base station of a cellular communication system, the first station comprises a mobile station of the cellular communication system, the communication path comprises a radio link between the  
15 stations, the first indicator comprises a bit error ratio in uplink direction, the second indicator comprises a bit error ratio in downlink direction; the third indicator comprises a frame erasure ratio in uplink direction, and the further indicator comprises a frame erasure ratio in downlink  
20 direction.

10. A communication system according to claim 8 or 9, wherein the estimated indicator is used for assessing the quality of the communication path.

25 11. A communication system according to any of claims 8 to 10, wherein the control unit is arranged to correlate the first indicator, the second indicator and the third indicator for obtaining the further indicator.

30



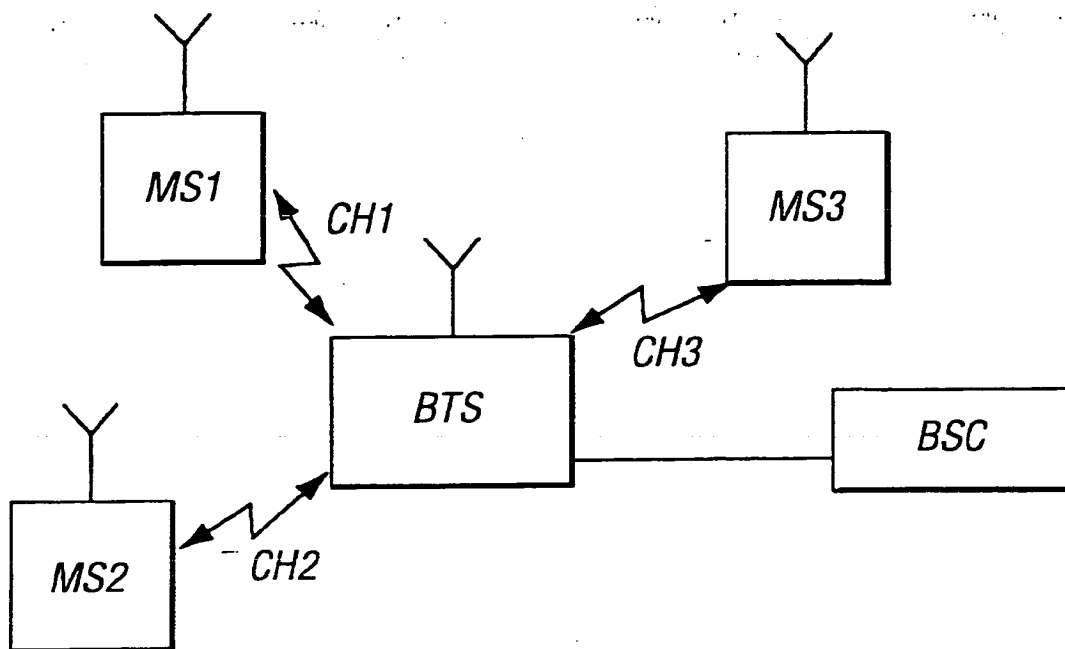


FIG. 1

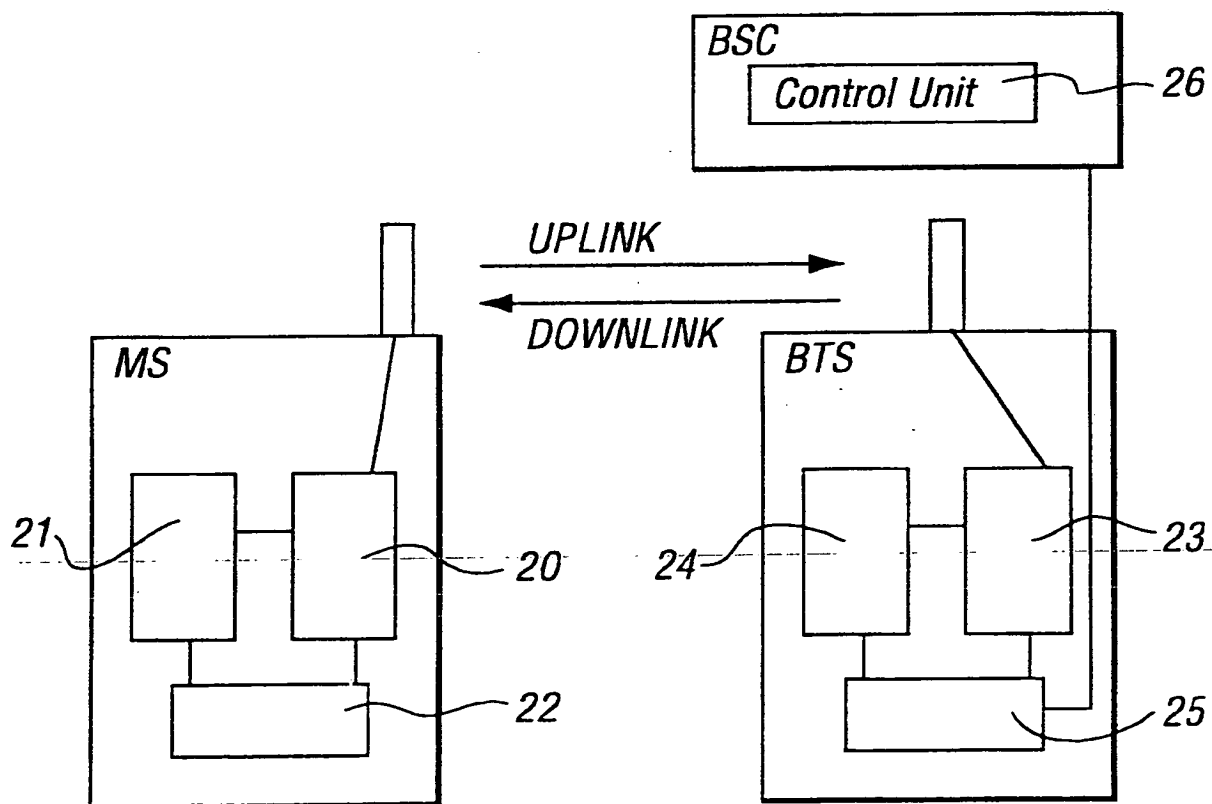
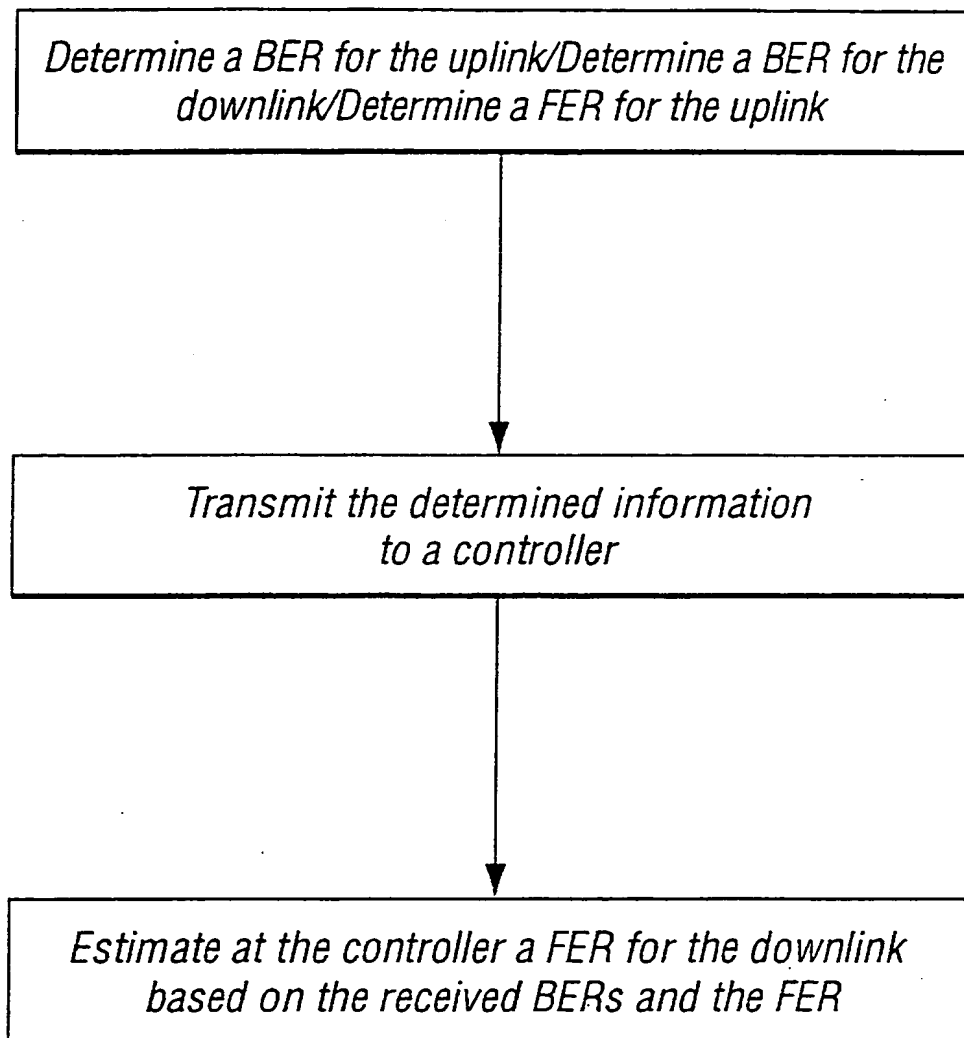


FIG. 2

FIG. 3